How ugly spiders produce beautiful silk

by Andrea Reitan

Many people are afraid of spiders, but they are excellent examples of God's engineering design in nature, especially in the production and use of their silk. Spider silk starts as a "liquid crystal"—a highly concentrated water-based solution containing rod-shaped molecules. This means it both flows like a liquid and has its molecules oriented and ordered like a crystal. The silk solution is produced and stored in a group of silk glands until it is drawn out through the silk ducts for use. Evolutionists cannot decide whether the liquid crystal structure is an "accident of Nature" or a necessary requirement, but they think it may help to control crystallization. If the silk crystallized prematurely, it would block the ducts and kill the spider. (De Luca & Rey) Creationists would call it a design feature.

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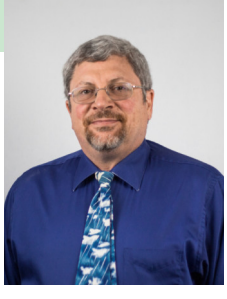
Be There! Creation Weekend '24

Amazing Creation Weekend coming October 25 and 26, 2024

For many years, in sponsoring Creation Weekend, our local association (CSAA or Creation Science Association of Alberta) has provided inspiration and information to audiences of all ages. The benefit from these weekends is training on how to be informed and enthusiastic, able to enjoy the insights that we hear, and to share those with others.

CREATION WEEKEND 2024
OUR REQUIRED RESPONSE TO THE AWESOME CREATOR
FREE ADMISSION
Featuring
Dr. Kurt Wise
Director of Creation Research Center at Truett McConnell University
Friday October 25 & Saturday October 26, 2024
Providence Canadian Reformed Church
12905 122 Avenue NW - Edmonton

But do we need to be informed about science? Indeed, we do! At a time when influential scientists are seeking to eliminate all worldviews from the public square other than their own, Christians need to know where they stand. In this context, **Dr. Kurt Wise** has for many years promoted a Christian worldview on science. Dr. Wise has long insisted that the natural world can be known and should be known. God tells us that He made it, so we are confident that there is much value in collecting information from nature. God wants us to study His Creation. What everybody must understand however, declares Dr. Wise, is that the study of nature is reasonable and logical only when one approaches this discipline from a Biblical worldview. It is this eminent scientist, Dr. Kurt Wise, that CSAA is excited to present as our



featured speaker for **Creation Weekend October 25 and 26, 2024!!**

Dr. Kurt Wise, Director of Creation Research at Truett McConnell University, fossil expert and Christian apologist, really needs little introduction. He is a well-known graduate from Harvard University in Paleontology where he interacted with many important names in science, especially in origins theories. He has since carried out research and mentored many young scientists, helping found the baraminology study group (which carries out research aimed at identifying the original kinds of creature at the creation). He also was one of the founding board members of the Creation Biology Society and the Creation Geology Society.

Dr. Wise has carried out fieldwork in early flood rocks in the Death Valley region, late Flood rocks in

Continued on page 2

Be There! Creation Weekend '24 – continued from page 1

Wyoming and post-Flood caves in Tennessee. He wrote two widely acclaimed books: *Faith, Form and Time* (2002) and *Something from Nothing* (2004), both unfortunately out of print. However, in 2018, a new textbook on biology was published: *Devotional Biology: Learning to Worship the Creator of Organisms.* This text is nothing like other biology texts. It does not really seek to teach biology *per se*, but is a philosophical discussion on the significance of biological phenomena in the light of God's Word.

In addition to the devotional emphasis, this book contains a plethora of fascinating information that is not readily found elsewhere. The appendix discussion on evolution and creation is exceptionally interesting. He starts by providing the arguments for evolution that one encounters in most high school and post-secondary courses. You can see how students in such classes are routinely bowled over and persuaded by these arguments. But it is not game over. He then shows what the preceding arguments failed to mention. Set, game and match to creation!!

Dr. Wise is so knowledgeable and his text is naturally valuable, but what price is good information worth? Nevertheless you can **hear him in person, for free, in Edmonton**, and glean some of these wonderful insights!

Our Required Response to the Awesome Creator, Friday and Saturday October 25 and 26 at venue: Providence Canadian Reformed Church, 12905 122 Avenue NW in Edmonton. Presentations include *Dinosaurs: Insights into Biblical History (*especially perfect for youth and families*)*; *Broken Cycles* (why there is no good scientific reason to reject the Bible's claims of recent creation); and *Compelling Creator* (whom do we worship, the Creator or created things?)

Mark your calendar and see our website for details. - www.create.ab.ca

Enhancing the Tour (guide) Experience

Now that the sixth edition of the Tour Guide to the Royal Tyrrell Museum has been published, readers have asked for some additional features. In response, we have produced a list of suggestions for ways to enhance one's use of the guide. In addition, CSAA has prepared a **custom map** that identifies the location of certain specimens highlighted in the Tour Guide. As a result of recent changes to the floor plan in the museum, it is helpful to better understand how to find various displays. If you have already purchased tour guides, and wish for these new free features, simply let us know by email or snail mail. From now on, those who purchase the Tour Guide, will automatically receive these two pages along with the booklet.

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Who Made It ???

Suppose you were to discover something new, maybe a piece of art, or a delicious dessert, a new book, a piece of furniture or even a building. One of the first things you might want to know is, who made it? It has been ever thus. Even ancient peoples noticed and made observations concerning what they saw around them. And they reflected on these issues. They studied the motions of the stars (and planets), the seasons and weather, and even plants and animals. For example, the prophet Isaiah wrote concerning God: "I made the earth and created man on it, it was my hands that stretched out the heavens, and I commanded all their host." Other ancient peoples attributed natural phenomoena to terrible pagan gods, never to the one true and benevolent God. For example in Psalm 96: 5-6 we read "For all the gods of the peoples are worthless idols, but the Lord made the heavens. Splendor and majesty are before him; strength and beauty are in his sanctuary."

Today we have amazing opportunities to observe and appreciate so many natural phenomena. Most of us have seen mountains and plains, waterfalls, forests and meadows. We have seen wild animals of many kinds. We have enjoyed exotic crops from the farthest corners of the earth. But do we stop to ask who made all these things? Do we express gratitude for all these blessings?

To some people, it is obvious that we owe our gratitude to an amazing intelligent Creator. Other people, unhappy at the idea that God might claim their allegiance, prefer to attribute the creation to blind processes involving time and chance. These phenomena (time and chance) do not demand anything from anybody., but God does.

Thus, one important aspect of the study of science, be it physics, chemistry or biology, is to understand that all created things bear testimony to the work and glory of the Creator. This realization means that each new discovery is an amazing journey of reflection. King David, three thousand years go, said it so aptly: "The heavens declare the glory of God, and the sky above proclaims his handiwork. Day to day pours out speech, and night to night reveals knowledge." (Psalm 19: 1-2)

So let us make the most of our opportunities for study of, and sharing with others, the wonders of God's creation. Some people imagine that study of science is not a useful addition to a Christian youngster's course of study. But it is! When we consider how nature displays rich variety and beauty, how can we not express our appreciation by looking more closely at its features? The more we look, the more interested we become and all the more we become amazed at the awesome Creator!

You can start your program by looking at the squirrels and rabbits in your neighborhood and the wild flowers (maybe weeds) thriving in the landscape nearby. If you can't think up a relevant question, reflect on how these creatures are designed to survive the winter in your area. Soon you will notice and ask questions about all sorts of interesting features of your community. Don't forget to consider why the plants and animals are the way you see them. Now you can move onward to studying the Creation in much more detail! And the good news is that there are lots of great resources to help you in your studies!

How ugly spiders produce beautiful silk!

Continued from page 1

Spider silk is a solution of fibroin molecules in water. When the spider draws out a strand, the water-based solution passes through the spider's spinning duct, rapidly assembling the proteins into an insoluble thread. This process involves precise control of the pH, concentration of ions, and water content in the duct (Römer & Scheibel). As the water evaporates, the silk hardens to a toughness up to ten times greater than similar man-made fibres which require processing at higher temperatures with harsher chemicals than what spiders use at room temperature (Kerkam *et al)*.

About half of the over 34,000 known spider species spin webs to catch their prey, and webs have been found to take over 130 different shapes with orb webs being among the most studied. These webs are typically made from multiple types of silk. Spiders use their dragline silk to make the frame and spokes of their orb webs. A temporary template for the capture spiral is made of silk from another gland and helps stabilize the web. Then they use "Flag silk," produced in another gland, for the capture spiral. This silk is super-stretchy to dissipate the impact energy of prey that collides with it, which can often be bigger than the spider! However, Flag silk is not sticky in itself. The stickiness comes from the glue the spider applies to the threads. Connections between the dragline and Flag silks, as well as between the web frame and the substratum (branches, building structures, furniture, etc.) are made from a fourth kind of silk produced in yet another gland that forms a sophisticated cement (Römer & Scheibel).

The proteins in spider silk are made up of repetitive amino acid sequences. These sequences are generally only 10-50 amino acids long, can be repeated hundreds of times within a single protein, and may comprise more than 90% of the whole silk protein. The ends of the silk proteins have non-repetitive regions about 100-200 amino acids long that are crucial for assembling the proteins into fibres (Römer & Scheibel).

In comparison to insects, spiders are unique in their silk-spinning capabilities. This is because an individual spider has multiple highly specialized glands that can produce very different silks simultaneously. Even the same silk from the same spider can have varying properties depending on environmental conditions, the amino acid composition of the silk solution, and diet (Vollrath & Knight).

Global silk production in 2022 was 91,221 metric tons (*Statistics | INTERNATIONAL SERICULTURAL COMMISSION*, n.d.), and as of April 2024, raw silk sold for $70-90US/kg, depending on the region (2021). This primarily comes from the chrysalises of the moth *Bombyx mori*. Scientists hope to one day produce artificial fibres based on the silk of the golden silk spider *Nephila clavipes*, which is tougher than moth silk (Vollrath & Knight).

Scientists have been experimenting with ways to produce spider silk for decades and have tried many biotechnological methods. The first attempt involved bacteria, but this host turned out to be unsuited to the task because the silk genes were just too big and the bacterial machinery for expressing the genes differed from spiders in its use of codons (Römer & Scheibel). Codons are DNA and RNA sequences three nucleotides long. Each codon codes for a specific amino acid to be added to a protein chain or a signal to stop.

Since bacteria were not ideal for producing spider silk, it was decided that a eukaryotic host (having a cell nucleus enclosed in a membrane) might work better. The yeast *Pichia pastoris* was tested, and this time, the problem was in purifying the silk proteins, not producing them. Plants, such as potato or tobacco, were also tried with similar results (Römer & Scheibel).

An article in the May 2002 *Dialogue* talked about how Nexia Biotechnologies experimented with using goats to produce silk in their milk glands (2002). However, the silk concentration was low, and there were more purification problems. Tests on other mammalian cell lines produced comparable results (Römer & Scheibel).

Another attempt used a modified

baculovirus to infect insect cell lines. In comparison to mammalian cells, this method is relatively easy to culture in a lab, and the gene expression conditions are potentially easily modified. However, it is too inefficient and expensive for large-scale production (Römer & Scheibel).

The focus eventually came back to using bacteria. This time, the spider silk genes were adapted to the bacterial codon usage and employed a combination of synthetic DNA modules and authentic gene sequences. This dramatically increased the yields, and it can also be engineered to include tailor-made properties for experimental analysis (Römer & Scheibel).

Attempts to spin synthetic spider silk using a tiny silicon spinneret have already met with some success. It is recognized that spiders' dragline silk requires a specific molecular structure for the silk molecules as well as crucial design characteristics for the spinning process (Vollrath & Knight), both of which God included when He made the first spiders during Creation Week.

Spider silk has a tensile strength similar to steel but is a much lighter material, so it is considered stronger. Kevlar, on the other hand, is three times stronger than spider silk but not as stretchy, so spider silk is considered tougher. For spider silk to be as stretchy as it is, its molecular "rods and springs" must be well-aligned. Kevlar does not have the right "molecular springs" in its fibres, which is why it lacks the elasticity of spider silk (Vollrath & Knight).

Another comparison with Kevlar is in the acid applied to the fibres during spinning. Spiders secrete hydrogen ions from proton pumps in the lining of the silk duct, making the solution more acidic. This is believed to help the fibre dry and stiffen. Kevlar fibres are spun from concentrated nylon solutions in sulfuric acid and passed through several water baths (Vollrath & Knight).

If spider silk is superior to man-made fibres, and even insect silk, why not farm spiders for their silk like we do with silkworms? Well, the process for reeling silk from the cocoons of *Bombyx mori* has been optimized only a little over centuries but is very cost-efficient. Spiders, on the other hand, have to be immobilized and their dragline silk drawn out manually, and this process is only suitable for dragline silk. It is also time-consuming and expensive. For another thing, most spiders are cannibals, although this is likely a result of the Fall, not God's design. These factors simply make spider silk farming inefficient and costly (Römer & Scheibel) whereas silkworm farming can be done with a relatively low financial investment and produce multiple crops of raw silk each year (Bhattacharjya *et al*).

God has engineered everything in a spider down to the molecular structure of its silk proteins to function according to His design. Humans have yet to gain a full understanding of what we observe around us. The things we do understand inspire us to learn more and try to replicate the processes. As it says in Proverbs 25:2, "It is the glory of God to conceal things, but the glory of kings is to search things out." Our search for knowledge and understanding should always start from a desire to glorify God.

References

Bhattacharjya, D., Alam, K., Bhuimali, A., & Saha, S. (2020). Status, potentials, constrains and strategies for development of sericulture farming system in West Bengal state of India (review). *Bulgarian Journal of Agricultural Science*, *26*, 709–718.

De Luca, G., & Rey, A. D. (2006). Biomimetics of spider silk spinning process. *Design and Nature III: Comparing Design in Nature with Science and Engineering*, *1*, 127–136. https://doi.org/10.2495/DN060121

Kerkam, K., Viney, C., Kaplan, D., & Lombardi, S. (1991). Liquid crystallinity of natural silk secretions. *Nature*, *349*(6310), 596–598. https://doi.org/10.1038/349596a0

Mike. (2021, January 22). Raw Silk price index. *Businessanalytiq*. https://businessanalytiq.com/procurementanalytics/index/raw-silk-price-index/

Moxie. (2002, May 1). Spider Silk? Bring On the Nanny Goats « Creation Science Association of Alberta. *Dialogue*. https://www.create.ab.ca/spider-silk-bring-on-the-nanny-goats/

Römer, L., & Scheibel, T. (2008). The elaborate structure of spider silk. *Prion*, *2*(4), 154–161.

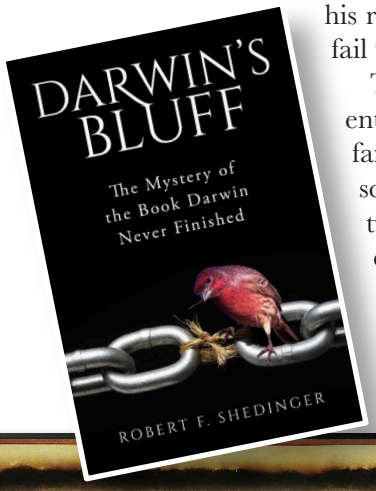
Statistics | INTERNATIONAL SERICULTURAL COMMISSION. (n.d.). Retrieved April 17, 2024, from https://inserco.org/en/statistics

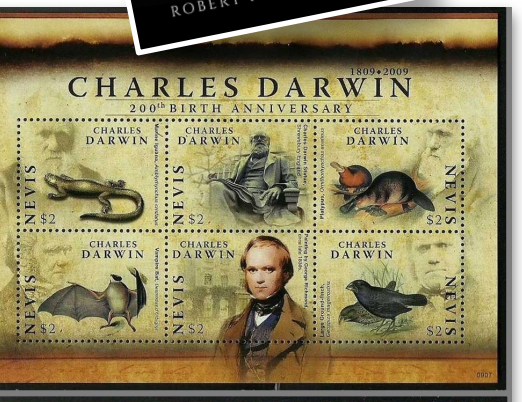
Vollrath, F., & Knight, D. P. (2001). Liquid crystalline spinning of spider silk. *Nature*, *410*(6828), 541–548. https://doi.org/10.1038/35069000

Why Darwin's legacy is so wrong!

Review by Margaret Helder

A project which has produced a delightful read on Darwin's life, views and impact, began many years ago when an undergraduate student, out of curiosity, dipped into a new volume in his university library. This volume was the first in a lengthy series from Cambridge University Press. These volumes contained the correspondence, both to and from, of Charles Darwin. Thus hooked on these communications, Robert Shedinger, who was majoring in a general arts degree, began a 40 years long research project on Charles Darwin's thoughts and actions. Astonished by what he found, Robert Shedinger now shares the results of his research. His book, *Darwin's Bluff,* can't fail to interest everyone.





The author had no preconceived scientific notions about Darwin. Thus, unfamiliar with the highly flattering descriptions about Darwin that we typically encounter, the author discovered a man who did not deliver the foundation to biology which is so often claimed for him. Thus Dr. Shedinger begins his biography with the words: "Few figures in the history of science lie more hidden behind a veil of mythology than Charles Darwin." (p. 21) The book's title centres on the occasion of Darwin's publishing *The Origin of Species* in 1859. And the book's cover illustration applies to the same event. The illustration depicts a finch (perhaps from the Galapagos Islands) contemplating a small piece of twine which supposedly holds two large pieces of chain together. Is Darwin's work the weak link in biological explanations? This book provides dramatic answers.

Apparently when Darwin published his famous book in 1859, he warned everyone that his work was a mere abstract or outline of his argument. It lacked specific examples and documentation. All these important features of a major theoretical statement would follow in his expanded publication on the topic. Darwin's objective in cautioning his readers about this new publication was to encourage his readers to lower their expectations for the present work. The readers would be less critical of his position, he hoped, if they thought most of the discussion was yet to come.

Dr. Shedinger declares that Darwin was a master at manipulating his reading audience in advance of any published work. Thus, Darwin typically assumed exaggerated humility in an attempt to persuade people to give him the benefit of the doubt. For example, in 1881, on another issue, Darwin wrote concerning one of his pet views in geology: "If I am wrong, the sooner I am knocked on the head and annihilated so much the better." (58) The desired response, so Darwin hoped, was that his views couldn't be that bad! Thus, also for the *Origin of Species*, Darwin sought to run himself down, so that readers would instead be encouraged to say nice things about his book. (p. 100)

The main rhetorical device Darwin used to short circuit criticism of *Origin of Species* was to insist that the book was only an abstract. Thus "[W]ith one exception, Darwin alerts every correspondent that his work is as yet only an abstract, and therefore should not be evaluated as a complete and thorough treatment of the subject." (p. 118) "Darwin further warns his readers that they will vehemently disagree with him. This is a brilliant rhetorical move. Who would harshly criticize someone who has gone to such lengths to humbly anticipate your negative reaction?" (p. 118)

The criticism that Darwin anticipated, and which indeed did come, was that the effects of natural selection could not reasonably be compared to artificial selection by breeders. Natural selection, working in nature, indeed results in the survival of some offspring but not of others. But nature never promotes the survival of individuals which possess a feature which might be

useful 10 or 20 generations into the future. However people who breed animals or plants rather select for individuals to cross which possess a trait which the breeders want to develop in the future The problem was that Darwin thought natural selection worked much like artificial selection (breeding). But natural selection lacks agency, purpose and planning, so it cannot achieve what breeding programs manage to obtain.

In short, Darwin's argument was not convincing. "Darwin needed hard evidence – evidence that he had already led many to believe would make its debut in his big book on natural selection, the *magnum opus* [big work] for which the *Origin* was merely an abstract." (p. 146) "The natural selection/artificial selection analogy was so foundational to Darwin's thinking –and so clearly problematic – that it threatened to unravel his entire theory." (p. 148) For example, "We think it difficult to find a theory fuller of assumptions; and assumptions not grounded upon alleged facts in nature, but which are absolutely opposed to all the facts we have been able to observe." [p. 153 quote from Samuel Wilberforce]

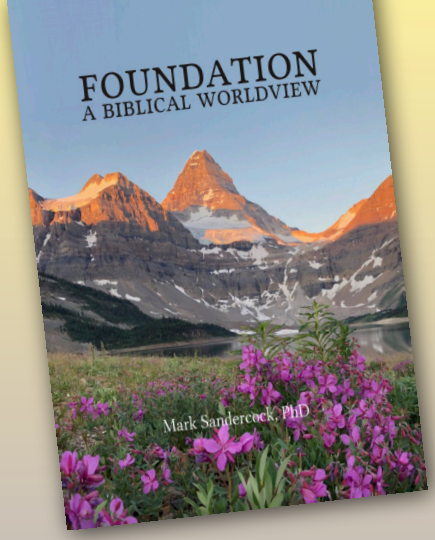
For a couple of years, Darwin kept promising that his major work would soon follow and it would establish all his arguments. But he never did get around to publishing this major work. Instead, he turned his attention to orchids. He hoped to use the information on orchids as a subtle argument to support his statements about the efficacy of natural selection to produce new body plans. There was just one problem with Darwin's hopes concerning the orchid book. Many people instead saw the examples described as coming from the work of the Creator or Intelligent Designer rather than from natural selection. [p. 192] For example, an anonymous review in the *Literary Churchman* declared: "We thank Mr. Darwin for putting before us so clearly these wonderful details of the workings of Nature, and so helping us to admire God in His works." (p. 192)

After 1862 and the orchid publication, Darwin turned his attention to other peripheral issues of biological interest. He never went back to his big book on *The Origin of Species*. The big book had already been largely drafted by 1859. However posthumous review of the manuscript established that it added little to the 'abstract,' already published. It turned out that the speculations and assumptions in *The Origin of Species* were all that Darwin had to offer. Later generations of scientists however, not as critical as Darwin's contemporaries, were happy to agree with the arguments in the 1859 document.

What this biography achieves, besides a fascinating account of Darwin's life and work, is to demonstrate that his most famous book does not provide a true picture of origins. The 1859 book is full of wishful thinking and confident assertions. This is not good enough to provide a foundation for interpretations in biology. Darwin's bluff was that he said he would demonstrate how natural selection leads to new animal forms. But he never did demonstrate any such thing. In agreeing with his arguments, the modern world has allowed Darwin to fool them.

Available from Amazon. Perfect for anyone who likes history and/or biography and/or a good read with some interesting implications for understanding of nature today.

Robert Shedinger. 2024. *Darwin's Bluff: The Mystery of the Book Darwin Never Finished.* Discovery Institute Press. pp. 283. (Reviewed by Margaret Helder)



Foundation: a Biblical Worldview

Mark Sandercock

This is a landmark book on apologetics which deals with Scripture, science and the current cultural milieu which plagues our society. The book is written for all interested Christians but especially for those who wonder about the reliability of the early chapters in Genesis. Each section is interesting and beautifully documented. People concerned about politics and social action will be especially interested in the third section of this volume.

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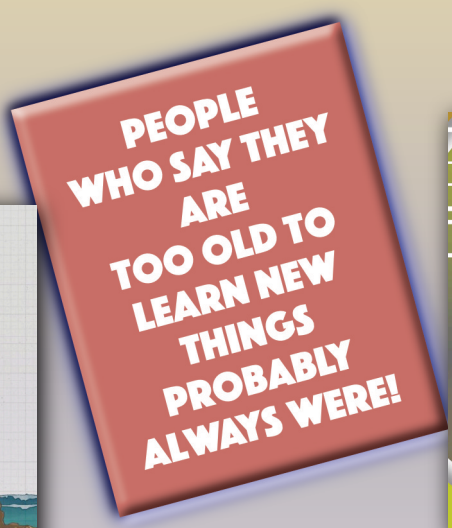

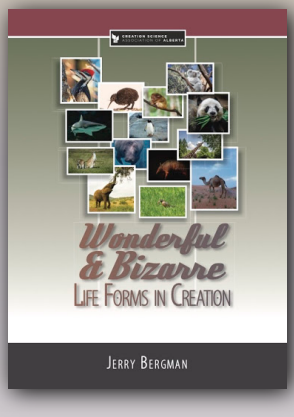

Wonderful and Bizarre Life Forms in Creation

Jerry Bergman

An excellent place to start one's journey of discovery into the wonders of the Creation! Discover this collection of amazing creatures that illustrate enormous variety. In many cases the details are so unexpected!! The selection includes some popular animals such as pandas, koala, elephant, giraffe, camel and penguins as well as some totally weird creatures. Explore all these details as well as the serious problems each presents for evolution theory.

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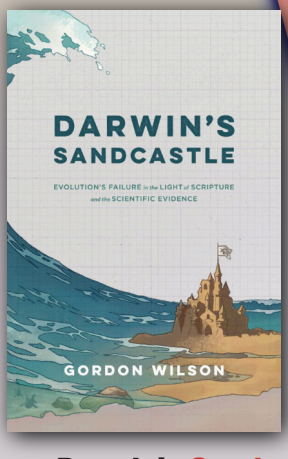

Darwin's Sandcastle

Gordon Wilson

This lively overview of young earth science shows us that there are many more issues involved in origins than just the fossil record and DNA. Were there always predatory and disease causing organisms? Do their features demonstrate design too? Why are there factions among Bible believing scientists? What does plate tectonics mean? This book provides some insights and food for thought on issues seldom mentioned in publications.

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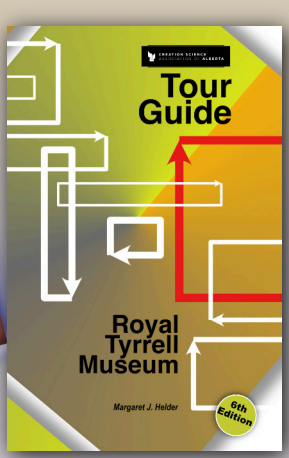

Tour Guide Royal Tyrrell Museum *(6th edition)*

Margaret Helder

This handy booklet highlights interesting details and fascinating insights to the displays in the museum. We expect the dinosaurs and marine reptiles, but there are also other beautiful fossils on display. This booklet guides you to each interesting exhibit and discusses its significance. There is a new section which provides arguments for evolution. Answers are provided and links to more detailed discussion online.

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